

VII. *Observations on the Oeconomy of the Ichneumon Manifestator Linn.*
By Thomas Marsham, Esq. Sec. L. S.

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THROUGHOUT the whole system of animal œconomy, there is not perhaps a more striking and distinguished feature, than the attention, care and foresight of every parent animal for the protection and preservation of its young. It is a property which pervades every class of animals, and is equally manifest in the most ferocious and the more timid, the largest and the most minute. The methods employed by each class and order differ as much as the animals themselves. In the higher orders of beings which are viviparous, not to mention the human race, we find this care extended to a considerable time after the birth of the young, as in quadrupeds, who nourish their little ones with a delicate nutritious fluid, copiously supplied by nature from their own bodies, and with an anxiety and care evidently apparent to the most common observer, until they are able to provide for themselves. The feathered tribes, which are oviparous, furnish an extraordinary instance of fortitude and patience during the tedious time of incubation, and of labour and unwearied diligence in search of food, after the young are hatched. As we descend to the lower orders, which are in general oviparous, we may readily discern strong marks of sagacity or instinct.

Reptiles

Reptiles and fish display great penetration in the mode and situation in which they deposit their eggs and spawn; but to the eyes of the penetrating naturalist, this care and attention will appear more artfully employed and more eminently conspicuous in those minute beings called insects, who, although on a cursory view they seem to contradict the general remark, by never living to assist their future offspring, yet to an attentive observer exhibit a system of ingenuity and contrivance scarcely to be credited, in searching out and determining a proper place for depositing their eggs, not only in safety from their numerous enemies, but also in situations where a sufficient quantity of food is on the spot to support and nourish the larva immediately on its breaking the shell: and so securely and successfully is this generally done, that it not only eludes the inquisitive and prying eye of man, and is impenetrable to the large animals, but even defies the combined power of the elements; for so artful and sagacious do these minute beings appear in all their operations, and so admirably are they furnished with instruments peculiarly adapted to each species, that one would think it impossible for any accident to hurt or destroy them. Yet such is the divine law of order established by the omniscient Creator, that no animal, however minute, is permitted to increase beyond the bounds prescribed. And it is therefore wisely ordained, that the cunning, sagacity, or instinct of one insect shall counteract and render futile the skill and labour of another, so that the artful preservation of one kind tends to the entire ruin and destruction of its neighbour, by which means an equilibrium is preserved, and no one species preponderates. To enumerate the different genera, or describe the method employed by each species that has been observed to secure its eggs, would far exceed my limits. Suffice it to say, that they are placed on the trunks, leaves, and even roots of trees and plants,
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in the waters, in putrid substances, and even on living animals. We find them closely united with a strong and firm cement round small branches of trees, fixed on elegant pedicles on the leaves, covered with hair from the body of the parent, or enclosed in delicate silken cases. These when hatched are visible, and their growth and wonderful operations may be seen and examined; but those who deposit their eggs in holes and crevices, in the bodies of animals, and even of insects themselves, are hatched, live, and come to perfection before they become visible, and we are content to know them in their last state only, and that imperfectly. The genus of insects called Ichneumon, from which I have selected a single species, has been ably described by the celebrated Reaumur, as far as he was then acquainted with their habits and œconomy. The whole of this genus are (if I may be allowed the expression) parasitical, that is, derive their support and nourishment from other insects, some depositing their eggs in the larva, others again in the pupa, and some even in the ovum or egg itself, the contents of which, minute as they are, are sufficient to support the young larvæ until their change into the pupa state. Some deposit only one egg in a place, as the *Ichneumon ovulorum*, and others again a great number, as *Ichneumon puparum*, &c. but whether the egg is placed in the pupa, larva, or ovum, the destruction of the foster-parent is inevitable. The larvæ of large moths or butterflies that have been wounded by an Ichneumon, live and feed, though with evident marks of disease, until these parasites are full fed, and able to change into their second or pupa state. To treat of each species of this genus, would fill a volume. I shall therefore confine myself to one, the *Ichneumon manifestator*, an insect truly wonderful in its formation, and which in a distinguishing manner unites the two properties before mentioned, viz. a penetration and fore-

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repeated three times ; but approaching too near, in hopes with a shallow magnifier to observe what passed at the end of the tube, I frightened it away. My curiosity being excited, I waited, but in vain, for the return of the fly, and had it not in my power to visit the same spot for a week ; but on the 16th of the same month I was amply gratified, luckily seeing many of them at work. They appeared to pierce the solid wood with their tubes, which they forced in even to half their length, constantly passing them down the abdomen between the hinder thighs, which closed and kept them straight whenever any over-resistance forced them to bend. I was so astonished to see an instrument apparently weak and slender, able, with the strength of so small an animal to pierce solid wood $\frac{1}{2}$ or $\frac{3}{4}$ of an inch deep, that I attended to every motion of the insect, hoping to discover in what manner it was done ; and on very particular attention I observed, that all those who appeared to pierce the solid wood, did it through the centre of a small white spot resembling mould or mildew, which on minute examination with a magnifier I found to be fine white sand, which delicately closed up a hole made by the *Apis maxillosa*, and where I have no doubt the bees' young were deposited. In deep holes that were not closed, the insect not only thrust in the whole tube, but in some cases the whole of the abdomen and posterior legs, leaving out only the two fore-feet and wings, which it placed in contrary directions like two arms. The grooves which inclose the tube were also projected up the back, with the ends appearing above the head out of the hole.

In October I saw another of these insects on a strong post, on Lessne's Heath, near Erith in Kent. It had fixed its tube before I arrived, and I waited a considerable time, in hopes it would withdraw it ; but a gentleman who was with me being impatient, and doubting my account of it, I with difficulty forced the insect to draw

it out, and then opened the hole, which was closed with a stiff pellet of turpentine.

Each succeeding year I had opportunities of seeing many of these insects at work ; but on the 23d of July 1791, I again paid very particular attention to some I saw in Kensington gardens, but more immediately to the action of the antennæ, which they thrust into many holes and crevices, but soon drew them out, not finding, I presume, a proper situation for their eggs. I observed one with its tube inserted into the side of a rail, which I watched with great attention (*fig. 4.*) It had fixed itself over a small patch of reddish sand that covered the hole of the *Apis maxillosa*, three of its legs being placed on each side the spot ; the abdomen was bent inward, so that the end of it was embraced by the hinder thighs, which kept it in a steady position, the whole tube being inserted in the rail. It frequently drew out the tube about $\frac{1}{4}$ or $\frac{3}{8}$ of an inch, and thrust it in again with great force ; in the interim between these thrusts, I could plainly perceive a motion in the apex of the abdomen connected with the tube similar to the pulsation of an artery, which motion ceased whenever the action of the tube took place. This pulsatory motion I conceive was occasioned by the eggs passing from the body of the insect to the tube ; and I felt an inclination to seize the little animal at the moment and examine the tube, which is of a fine crimson colour and semi-transparent, to see if an egg might remain in it : but an anxious desire to see the whole of its operation prevented me ; and when it had finished its work and withdrawn the tube, it was too late.—Another particular instance of sagacity in this little animal is worthy of remark : the grooves or cases of the tube were as usual projected in a straight line from the abdomen ; but the wind being very powerful, rendered it difficult for this delicate animal to maintain its situation, as these long cases,
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Ichneumon manifestator Linn

which are feathered (*fig. 5*), were so strongly acted upon by the wind as to endanger its being overfet several times. To remedy this inconvenience, it, with a wonderful dexterity, brought them down between its legs, and projected them forwards under its body toward the head, by which means it retained its situation securely. It is now seven years since I began my observations on this little animal, in which time I have never been able to discover an *Ichneumon* that I could suspect to be the male, and am therefore led to make these remarks public, in hopes some gentleman may have been more successful, and by whose means its history may be completed.

EXPLANATION OF TAB. 4.

Fig. 1—4. Represents the *Ichneumon manifestator* in the several positions described in the preceding paper.

5. The tube and its sheaths highly magnified.